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THE PAN-PACIFIC ENTOMOLOGIST

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The Pan-Pacific Entomologist

VOL. XVII, No. 4 October, 1941

ADDITIONAL OBSERVATIONS AND DESCRIPTIONS OF SOME SPECIES OF PLEOCOMA

(Coleoptera, Scarabæidæ)

BY E. GORTON LINSLEY

University of California

The following observations on *Pleocoma* have been accumulated by the writer since the publication of miscellaneous notes on the genus in 1938.[1] For the privilege of studying material from their own collections or collections in their care, the writer is indebted to Mr. Charles Harbison of the San Diego Society of Natural History, Mr. J. C. von Bloeker of the Los Angeles Museum, Dr. J. M. Linsdale of the University of California, Mr. Fred Platt, Mr. J. W. Johnson, Mr. A. T. McClay, and Mr. George Mansfield.

PLEOCOMA CONJUNGENS Horn

This species is but little larger than the coastal form of *P. hirticollis* Schaufuss, and all of the examples at hand are less than 24 mm. in length. Specimens from Ben Lomond, Santa Cruz Mts., Calif., sent for identification by Mr. V. R. Jones, differ from Mr. Davis' figure (Bull. So. Calif. Acad. Sci., 34, pl. 1, f. 10, 1935) by having the lamella of the fifth antennal segment only about one-half as long as that of the sixth. Possibly Mr. Davis' figure was made from a specimen of *hirsuta* Davis rather than of *conjungens* Horn, since in his description of the latter species (l. c., p. 28-29) he states that the lamella of the fifth segment is about five-eighths as long as that of the sixth. In any event it is probable that this character is variable and the Ben Lomond specimens are without a doubt referable to *P. conjungens* Horn.

Pleocoma lucia Linsley, new species

Male. Form oblong-ovate, moderately large, color dark piceous; pubescence golden. *Head* distinctly, rather closely punctate; clypeus reflexed, anterior process moderately shallowly notched at apex, angles moderately obtuse, surface closely punctate, clothed

[1] Linsley, E. G., 1938. Notes on the habits, distribution, and status of some species of *Pleocoma*. Pan-Pac. Ent., 14:49-58, 97-104.

with coarse, erect, golden setæ, vertical horn obtuse, apex very feebly notched; ocular canthi rounded apically, projecting at an angle, punctate and pubescent; antennæ reddish brown, scape conical, second segment moniliform, broader than long, third segment less than three times as long as greatest width, subangulate, fourth segment without a lamella, fifth segment with a very short lamella, lamella of sixth segment about two-thirds as long as that of seventh segment, remaining segments forming club, eleventh segment distinctly shorter than tenth segment. *Pronotum* transverse, shining, widest behind the middle, basal angles rounded, surface moderately finely, not closely punctate, lateral discal impressions deep, very distinct, basal impressions moderate; scutellum glabrous, shining, almost impunctate. *Elytra* oblong-ovate, finely punctate; geminate striæ very feeble. *Legs* hairy; tarsi longer than tibiæ. *Abdomen* with sternites rufo-testaceous, clothed with golden pubescence. Length, 23 mm.

Female. Form elongate oval; color reddish brown; clypeus shallowly emarginate at middle, vertical horn short, broad; antennæ reddish brown, fifth segment angulate, sixth segment with a short lamella, segments seven to eleven forming club; pronotum transverse, finely, not closely punctate, widest at posterior angles, disk without a transverse elevation; scutellum glabrous, almost impunctate; elytra suboval, widest behind middle, surface shallowly, not closely punctate. Length, 40-42 mm.

Holotype, male, No. 5180, Calif. Acad. Sci., Ent., collected by J. M. Linsdale at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Santa Lucia Mountains, Monterey County, California, January 21, 1939. Allotype, female, No. 5181, and one paratype, female (collection of Hastings Natural History Survey) also collected near Jamesburg and submitted by Dr. Linsdale.

This species appears to be related to *P. conjungens* Horn. It may be distinguished by the structure of the male antennæ (club composed of only five full length lamellæ with the lamella of the fifth segment vestigal and that of the fourth segment lacking) and the form of the pronotum (widest behind the middle with prominent basal angles and deep lateral discal impressions).

Pleocoma hirsuta (Davis)

An examination of the type confirms the opinion previously expressed by the writer that *hirsuta* should be regarded as a distinct species (or at the very least a subspecies) and not as a variety of *conjungens*. The type bears the following data: "Ridge

Route, 1-22-33, R. D. Lusk. Found about 7 mi. this side [toward Los Angeles] of the summit [Sandbergs]—hundreds flying through the air just below the snow line about 5:00 P.M."

In the collection of the Los Angeles Museum there is an example from Bee Rock, Griffith Park, Los Angeles, California (Brereton), which appears to be referable to *hirsuta* and which thus slightly extends the known range.

Pleocoma nitida Linsley, new species

Male. Form large, robust, broadly oval, only moderately convex; integument mostly dark brown, legs reddish brown, elytra black, shining; pubescence golden. *Head* coarsely, closely punctate except for a broad smooth band near inner anterior margin of eye; clypeus very coarsely punctate at middle, the punctures becoming smaller laterally and anteriorly, anterior process scarcely reflexed, deeply, obtusely notched, angles acute, produced, vertical horn elongate, sides nearly parallel, apex notched, surface clothed with long hairs; ocular canthi with anterior margin projecting slightly forward from a right angle, apex moderately acute; antennæ with segments reddish and lamellæ dark brown, scape conical, second segment moniliform, third segment elongate, slender, curved, widest at apex, fourth segment with an acute process, fifth segment with a lamella about one-half as long as that of sixth segment, lamella of ninth segment longest, lamellæ of tenth and eleventh segments and those of segments eight, seven, and six, decreasing in length from that of ninth segment. *Pronotum* nearly two and one-half times as wide as greatest length, widest at base, posterior angles prominent, slightly produced, anterior concavity very coarsely, closely punctate, clothed with long hairs, posterior median impression feeble, lateral discal pits not evident; scutellum black, punctation denser along median line, pubescence fine, sparse; legs reddish brown, densely clothed with long, golden hairs. *Elytra* together about one-eighth longer than wide; integument black, shining, sparsely punctate; geminate striæ very feeble, indicated by rows of shallow punctures; sutural striæ shallow. *Abdomen* with sternites reddish brown, densely clothed with golden hairs. Length, 28 mm.

Female. Form broadly oval, widest behind middle; color reddish brown, elytra paler. *Head* moderately coarsely punctate; clypeus dull, anterior process shallowly emarginate, vertical horn low, apex bifid, area behind and on each side of vertical horn smooth, polished, sparsely punctate, antennæ with basal segments pale, club dark brown, fourth segment angulate, segments five to eleven forming club. *Pronotum* shaped much as in male, nearly twice as wide as long, widest at posterior margin, posterior angles

prominent, a little produced, surface moderately, coarsely, closely, irregularly punctate, posterior median impression shallow but distinct; scutellum less coarsely punctate than pronotum, with a few fine hairs. *Elytra* pale reddish brown, surface smooth, polished, shining, finely, sparsely punctate; sutural striæ shallow but distinct; costæ distinct at base, becoming evanescent posteriorly. Length, 31.5 mm.; breadth across apical one-third of elytra, 21 mm.

Holotype, male, No. 5182, Calif. Acad. Sci., Ent., collected one mile south of Atascadero, San Luis Obispo County, California, December 19, 1940, 6:30 A.M.; temperature, 45° F. ["There was a very heavy radiation fog that morning and visibility was very limited. It was caught about three-quarter hour before sunrise at a light on the front porch of a house."] and allotype, female, No. 5183, from 6 miles east of Santa Margarita, San Luis Obispo County, California, on the Calf Canyon Road, January 24, 1941. Both specimens were sent by Mr. George Mansfield, to whom the writer is indebted for the privilege of studying them. Mr. Mansfield writes of the allotype, "I asked the person who gave it to me as to the habitat in which he found it and he describes it as follows: 'It was dug out of ground. Chemise and manzanita brush and also greasewood.' I presume he means *Adenostoma fasciculatum, Arctostaphylos* sp., and *Baccharis* sp."

P. nitida is related to *P. hirsuta* Davis and may prove to be only subspecifically distinct. It differs from *hirsuta* primarily in the wider pronotum, sparsely hairy head, form of the clypeal process, glabrous scutellum, and highly polished elytra. In size, *nitida* is suggestive of *blaisdelli* but may be separated by the broad pronotum with prominent posterior angles, the less convex form, and shining pronotum and elytra. From both *conjungens* and *lucia* it may be distinguished by its larger size, smoother and more shining elytra, rough, pubescent anterior pronotal concavity, and more elongate antennal club. From *lucia* it further differs in the absence of lateral pronotal pits, strong posterior angles of the pronotum, broad, bifid, vertical clypeal horn, and acutely angulate process of clypeus.

Pleocoma sp.

In the collection of the Los Angeles Museum there is a female of the *conjungens* group from Santa Barbara, California, March

9, 1933, collected by Dr. J. A. Comstock. It differs from the female of *nitida* in the form and proportions of the pronotum and antennæ. It probably represents a distinct species although it may prove to be the female of *P. hirsuta* Davis.

The males of the various species mentioned above (as well as that of *blaisdelli* Linsley) will run in Mr. Davis' key (Bull. So. Calif. Acad. Sci., 34: 7-8, 1935) to *Pleocoma conjungens* Horn. Since they are all somewhat similar, the following key has been prepared to facilitate their separation. It is probable that some of the characters used below will prove to be variable when longer series are available for study and in case of discrepancies the full descriptions should be consulted.

Key to Males of Conjungens Group

1. Anterior impression of pronotum a little more coarsely, closely punctate than disk, sparsely hairy; average size about 22 mm. (range 20-23.5 mm.) 2
–. Anterior impression of pronotum coarsely, closely punctate, densely hairy; average size about 26 mm. (range 24.5-28 mm) .. 3
2. Antennal club composed of six full-length lamellæ, lamella of fifth segment at least one-half as long as sixth, fourth segment with a short lamella; ocular canthi almost right-angular, surface polished, impunctate; pronotum widest at basal angles, basal angles prominent, lateral discal impressions very feeble or lacking. Santa Cruz Mountains ..... *conjungens*
–. Antennal club composed of five full-length lamellæ, lamella of sixth segment more than half as long as seventh, lamella of fifth segment vestigial, fourth segment not lamellate; ocular canthi rounded, projecting at an angle, surface closely punctate; pronotum widest behind middle, basal angles rounded, lateral discal impressions deep. Northern Santa Lucia Mountains ..... *lucia*
3. Pronotum shining, posterior angles prominent, slightly produced 4
–. Pronotum dullish, posterior angles obtuse, not produced; greatest width of pronotum about twice greatest length; hairs of upper surface of head mostly confined to vertical horn and anterior process of clypeus. Foothills of Calaveras County. ..... *blaisdelli*
4. Greatest width of pronotum at most twice greatest length; dorsal surface of head very hairy; anterior process of clypeus strongly reflexed, lateral angles acute but scarcely produced, emargination almost right-angular; elytra moderately shining; scutellum thinly clothed with long hairs. Los Angeles County. ..... *hirsuta*

–. Greatest width of pronotum nearly two and one-half times greatest length; dorsal surface of head sparsely hairy; anterior process of clypeus not reflexed; lateral angles very acute, produced, emargination obtuse, rounded; elytra highly polished; scutellum without long hairs. Coast Ranges of San Luis Obispo County.....*nitida*

PLEOCOMA HIRTICOLLIS VANDYKEI Linsley

The description of the female of this subspecies was inadvertently omitted from a previous paper. It is therefore presented at this time.

Female. Form small, convex; color brown. *Head* rugose; clypeus with anterior process broadly rounded at sides, shallowly emarginate at apex, vertical horn very short; ocular canthi triangular; antennæ pale at base, club dark, segments five to eleven forming club, relative proportions of lamellæ much as in male. *Pronotum* about twice as wide as long, coarsely rugoso-punctate, surface with a few fine scattered hairs; scutellum shining, subglabrous, punctured at base; legs short, very hairy. *Elytra* scarcely longer than broad, widest at apical one-third; surface shining, sparsely punctate; sutural striæ shallow; geminate striæ feeble. Length, 22 mm.; width, 14.5 mm.

Neallotype, female, No. 5184, Calif. Acad. Sci., Ent., from Eldridge, Sonoma County, California, May 30, 1917, in the collection of Dr. E. C. Van Dyke.

PLEOCOMA HOPPINGI Fall

Mr. Darwin Tiemann has recently collected five males of this species in Yosemite National Park, making a considerable northern extension of the previously known range. Four of these specimens were taken at Camp Cascades, elevation 4000 feet, on January 18 and 27, 1939, and on January 12, 1940. The fifth specimen was captured at Grouse Creek, elevation 6000 feet, on February 5, 1940.

Mr. Hopping[2] has recorded the probable host of this species as the mountain misery, *Chamæbatia foliolosa* Benth.

PLEOCOMA EDWARDSII LeConte

A male of this rare species was captured at Grass Valley, November 17, 1938, by Mr. William Perry, who kindly presented it to the writer.

[2] Hopping, R., Proc. Pac. Coast Ent. Soc. (62nd meeting, 1916), p. 137.

PLEOCOMA DUBITALIS Davis

I have recently examined two males of *P. dubitalis dubitalis* Davis from McMinnville, Yamhill County, Oregon, December, 1936, in the collection of Mr. A. T. McClay. This locality is of special interest because it partially fills the existing break in the known distribution of this subspecies (see map, Pan-Pac. Ent., 14:103, 1938).

PLEOCOMA CARINATA Linsley

Through the kindness of Mr. McClay, I have also had the privilege of examining three examples of *P. carinata* Linsley from Dead Indian Soda Springs, Oregon. They were captured in a rainstorm on October 20, 1934, by Mr. L. G. Gentner. Two of the specimens have the anterior longitudinal impression of the pronotum clothed with long, erect hairs, emphasizing a relationship with *P. simi* Davis.

PLEOCOMA SHASTENSIS Van Dyke

Pleocoma shastensis Van Dyke flies in the early morning from about 6 A.M. to about 10 A.M. and again in the afternoon and evening from about 3 P.M. to 9 P.M. Specimens have also been captured at light. Rivers (Ent. Amer., 5:17, 1889), on the authority of Oscar Baron, has recorded the latter habit for *P. fimbriata* LeConte and it has also been recently observed in *P. nitida* Linsley and *P. rickseckeri* Horn, but I am not aware that it has been reported for other species. Davis (Bull. So. Calif. Acad. Sci., 33:129, 1934) states that he was unable to attract *P badia* Fall to automobile headlights, and similar attempts with *P. behrensii* LeConte have also failed. However, Davis also reports an observation by Kenneth Monroe that some "large brown bugs" were flying into a fire during a rain at Pine Flats, near Pasadena, California, and suggests that these may have been *Pleocoma.*

The color of the pubescence in *shastensis* varies in much the same way as has been recorded for *puncticollis* Rivers (Linsley, 1938:97). In the majority of specimens the hairs are brownish black but in occasional examples they are light brown. The latter specimens would run in Davis' key (1935:7) near *simi* Davis but may be distinguished by the glabrous pronotal impression. They also suggest *carinata* Linsley, but in this last species

the pubescence is golden, the form more oval, and the ocular canthi are at right angles to the longitudinal axis of the clypeus.

PLEOCOMA AUSTRALIS Fall

This species is apparently much more widely distributed than has been previously recognized. Prior to 1937, it was known only from Mt. Wilson, California. In the latter year, Moore (Occ. Pap. San Diego Soc. Nat. Hist., 2:83, 1937) recorded specimens from Hot Springs Mountain, near Warner's Hot Springs, San Diego County, California. These specimens have recently been studied and the identification confirmed. Through the efforts of Mr. F. R. Platt, a portion of the existing gap in the known distribution has been filled by the capture of a fine series of specimens at Lake Hemet, San Jacinto Mountains, Calif., on October 26, 1940. This is the first record of a species of *Pleocoma* from this range of mountains[3]. The range of *P. australis* has also been extended eastward by the capture of a male and female by Mr. J. W. Johnson at San Sevaine Ridge, near Lytle Creek, San Gabriel Mountains, San Bernardino County, California.

PLEOCOMA BEHRENSII LeConte

Additional data on the distribution of this species have been obtained through the capture of a male and female at Sharp Park, San Mateo County, California, October 30, 1940, by W. H. Lange, Jr. The female is smaller than usual for *behrensii*, with the geminate striæ more strongly impressed and the pronotum more densely and deeply punctate. The male, like others from San Mateo County as well as one at hand from Angel Island, San Francisco Bay, differs from those of typical *behrensii* by having the pronotum a little more closely punctate and the integument is slightly duller and more hairy. It is possible that the San Mateo County form represents a subspecies of *P. behrensii*.

PLEOCOMA PUNCTICOLLIS Rivers

In the collection of the San Diego Society of Natural History there are several examples of this species from Ramona, San Diego County, California, collected by John W. Snyder and also specimens from Alamo, Lower California, December 5, 1926.

[3] In the summer of 1939, Mr. E. S. Ross and the writer found *Pleocoma* elytra at Herkey Creek, not far from Lake Hemet, but it was not possible to identify the species involved.

EXTERNAL SEX CHARACTERS OF TWO IMPORTANT NATIVE PREDATORS OF THE MOUNTAIN PINE BEETLE IN SUGAR PINE

(Coleoptera: Ostomatidæ, Cleridæ)

BY G. R. STRUBLE[1] AND L. H. CARPELAN[2]

INTRODUCTION

The green trogositid, *Temnochila virescens* (F.) var. *chlorodia* Mann. (Ostomatidæ), and the red-bellied clerid, *Enoclerus sphegeus* F. (Cleridæ), are the most important insect enemies of the mountain pine beetle (*Dendroctonus monticolæ* Hopk.) in sugar pine. Both these beetles are consistently associated with *Dendroctonus* infestations, but neither of them ever occurs in numbers sufficient to check the development and spread of outbreaks of the mountain pine beetle.

In biological studies pertaining to the two species, a handicap was found in setting up mating pairs for oviposition, owing to an apparent lack of any differentiating external sexual character by which the males and females could be segregated. This was partially overcome by placing a number of adults of a given species in a container and later separating out pairs inclined to mate. While this method was rather successful, the adults often resorted to fighting which resulted in injury or death. This factor, in addition to the time required in making a proper setup, emphasized more than ever the need for the discovery of a constant sexual character by which the adults could be separated. Furthermore, the segregation of sexes on the basis of mating behavior often resulted in pairs of the same sex.

METHODS

In the search for a character or characters, each species was studied assiduously under the binocular microscope. Characters commonly used by coleopterists to differentiate between sexes were examined. First consideration was given to differences which might be found in number and relative size of antennal segments, size and number of tarsal segments, differences in punctation and striation, and differences in external genitalia. To facilitate these observations, microscope glass slides were especially prepared of appendages, genitalia, and exoskeletons from both sexes.

[1] Associate Entomologist, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.
[2] Agent, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Description of Sex Characters

These studies resulted in the discovery of a character for each species of predator which is constant and fairly easy to distinguish with the aid of an 8X hand lens or low-power binocular microscope. Detailed illustrations of the character for each species are presented in Figures 1 and 2.

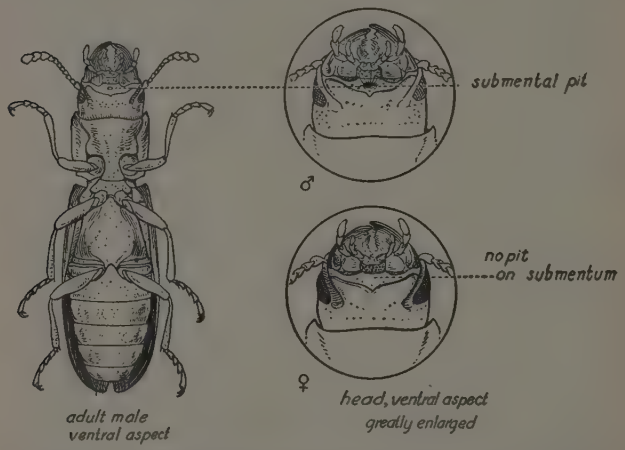

Figure 1. *Temnochila virescens chlorodia* (Mann.), showing difference between sexes.

Temnochila virescens (Fabr.)

On the broad central area of the submentum of the male there is a median pit[1] containing a group of hairs. This sclerite is fairly broad medially, with lateral extensions narrow. Both pit and submentum are sufficiently large to be seen under an 8X hand lens. Examinations of the genitalia of five individuals with the submental pit and five without it indicated that those beetles possessing the pit were definitely males, while those lacking the pit were females.

It was thus fairly clear that the male could be differentiated from the female by this character. In order to substantiate this

[1] This pit has not been referred to in the literature in describing the genus or species. (See References.)

belief without further dissection the following observations were made:

(1) Four mated pairs, which had been the most productive egg layers in the laboratory, were examined, and in each case found to contain one individual with and one without the submental pit. Observations of mating behavior indicated that the male possessed the character.

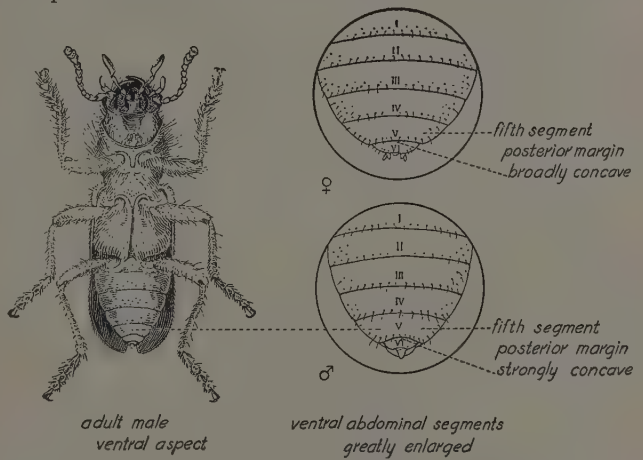

Figure 2. *Enoclerus sphegeus* (Fabr.), showing difference between sexes.

(2) A similar condition existed in eight of ten pairs set up on the basis of mating behavior. In the other two pairs of this group, both the individuals had the pit, *i.e.*, both were males. This is the situation mentioned previously, whereby as a result of mating behavior, pairs of beetles are often mismated.

(3) On the basis of presence or absence of the pit, forty-six individuals were segregated into two homogeneous groups. Mating was not observed within either of these groups, thus indicating that the sexes had been properly separated. When the groups were combined so that equal sex distribution was obtained, mating was observed immediately. A careful examination of each mated pair showed the presence of the submental pit in the male and the total absence of this structure in the female.

ENOCLERUS SPHEGEUS (Fabr.)

The only constant sexual character found on this species is in the fifth (penultimate) abdominal sternite. In the male the posterior margin of this sternite is definitely concave. In the female the curve is not so pronounced. This character can be used successfully and accurately after some experience.

In alcoholic or mounted specimens the character is sufficiently good to allow perfect accuracy (as checked by examination of genitalia) in determining differences between sexes. In the living individual, examined under a hand lens or dissecting microscope, observation of this character is made difficult by the great activity of this species. The insect also has the habit of curling up the abdomen, and as a consequence the penultimate sternite is difficult to observe carefully.

The use of an anesthetic to quiet the beetles, or of refrigeration to slow them down, would make the determination fairly easy. While this character is constant, it is complicated by the behavior of the active beetle, and had best be regarded as a temporary aid in distinguishing the sexes.

REFERENCES

Fabricius, J. C. 1775. Systema Entomologiæ. Appendix, p. 817. (*Lucanus virescens* Fabr.)

Olivier, A. G. 1790. Entomologie, 2; No. 19, 8. (*Trogosita virescens* Fabr.)

Westwood, J. O. 1835. Zoological Journal, 5:231. (*Temnochila* Westw.)

A NEW SPECIES OF ELEODES FROM OREGON, BELONGING TO THE SUBGENUS BLAPYLIS

(Coleoptera, Tenebrionidæ)

BY FRANK E. BLAISDELL, SR.

Stanford Medical School and Associate in Research, California Academy of Sciences, San Francisco, California.

The author has recently received a series of a species of *Eleodes* which belongs to the subgenus *Blapylis*. This species apparently inhabits a limited geographical area in Oregon.

Eleodes (Blapylis) oregona Blaisdell, new species

Form moderately robust, differing in the sexes from oblong-suboval to ovate and about twice as long as wide. Color black, luster dull. Not pubescent, punctures inconspicuously setose.

Head moderately small, in width about equal to one-half that of pronotum and not quite as wide as pronotal apex; twice as wide as long before post-ocular line; sides scarcely more prominent than eyes, margins arcuate over antennal insertions, thence convergent and less arcuate, continuously so with sides of epistoma, and as a whole broadly and slightly sinuate across the position of oblique sutures; epistomal angles evenly arcuate, apex moderately emarginate. Frons slightly convex, more strongly so over antennal insertions and declivous against eyes; feebly impressed on the positions of transverse and oblique sutures, the former obsolete, the latter more or less indicated; surface very densely and coarsely punctate, punctures rather strongly impressed, less so on epistoma. Labrum relatively small, transverse, sides and angles evenly arcuate and convergent to apical emargination, the latter median, narrow and as wide as deep; surface feebly convex, equally divided by a fine transverse carinule into an apical and basal portion; the latter smooth and sculptureless, the former slightly declivous, finely and densely punctate, punctures setigerous, the marginal setæ longer, forming a fringe. In the specimens studied the articulating membrane is only visible at apical epistomal emargination. Eyes moderately short, superior lobe small. Tempora not strongly convex, gradually convergent posteriorly from margin of eyes.

Antennæ moderate in length and comparatively slender, about attaining pronotal base; second segment subannular, as long as wide, somewhat convergent basally; third elongate, obconical, about three times as long as wide at apex and three times as long as second; segments four and five equal in length, one-third longer than wide at apex; six, seven and eight inclusive, obconical, surface lines of fourth quite parallel, those of five, six and seven slightly arcuate; fourth to eighth inclusive equal in width of apices; segments nine, ten and eleven slightly wider and feebly compressed; ninth subspherical, tenth irregularly spherical in outline, eleventh obovate and truncate at apex.

Pronotum moderately transverse, one-third wider than long, widest at middle; apex moderately emarginate, angles evenly rounded, not in the least prominent anteriorly; sides broadly and strongly arcuate, moderately convergent anteriorly to apical angles, slightly less arcuate in posterior third, briefly sinuate in basal seventh, angles small and more or less rectangular; base broadly arcuate and one-fourth wider than apex; disk moderately and quite evenly convex, densely, coarsely and irregularly punctate, intervals noticeably varying in width; laterally punctures

less deep and smaller in the unimpressed submarginal area; marginal bead very fine throughout, slightly obliterated on apex.

Elytra differing more or less in form in the sexes, a little more than twice as long as pronotum, viewed from above; moderately convex in central area and arcuately declivous laterally, arcuately and vertically precipitous at apex; base transverse without marginal bead; humeri obsolete, continuously rounded with the sides, rarely slightly angulate; sides broadly and rather strongly arcuate, apex obtusely rounded; surface in the central area with well separated punctures, which are slightly impressed and not strongly defined, not in the least muricate, intervals flat; laterally and apically gradually becoming small; oblique muricate tubercles intermixed in the humeral regions; extreme sides and apical declivity with scattered, round, smooth, shining points; epipleuræ sparsely punctate, punctures moderately small and more or less distinctly defined. *Scutellum* arcuate at apex, surface closely punctate, punctures small.

Ventral surface more shining and more or less polished. Pronotal sides quite strongly convex and rather densely set with small muricate points and somewhat rugose, especially on coxal convexities. Sterna and episterna densely punctate, punctures small and submuricate. Abdomen smooth, sparsely punctate, punctures small, somewhat denser at sides of first abdominal segment. Legs moderate in length and stoutness. Meta- and mesofemora not inflated and parallel. Metafemora and metatibiæ subequal in length, the latter moderately slender, slightly arcuate in basal fourth and gradually widened in apical fourth. Metatarsi three-fifths as long as their tibiæ; fourth segments about a third longer than the first, twice as long as the third, the latter about one-third longer than the second.

Male. Narrower, oblong-suboval. Elytra subparallel, sides less strongly arcuate. Antennæ a little longer. Abdomen flattened in middle third of first three segments; first segment densely punctate and more or less rugulose, others less densely so with some rugulation.

Female. Ovate and more robust. Elytra but little longer than wide, nearly circular in outline viewed from above, sometimes slightly straighter and convergent in about basal third to base; sides more or less evenly and strongly arcuate, continuously so with the humeri. Abdomen moderately convex, flattened between the coxæ, rather less strongly sculptured.

Measurements of types. Male: length 15 mm.; width 7 mm. Female: length 15 mm.; width 8.5 mm.

Holotype, female, No. 5188, Calif. Acad. Sci., Ent., Bear Springs, Oregon, May 18, 1940 (K. M. and D. M. Fender) in the Blaisdell collection. Allotype, male, No. 5189, Calif. Acad. Sci., Ent., same data, except collected on May 26. Paratypes,

forty specimens with same data, distributed as follows: collection of the California Academy of Sciences and that of the author, 11; American Entomological Society, 4; and K. M. and D. M. Fender, 28.

Oregona belongs to the Cordata Group of the subgenus *Blapylis*. Other species that may occur in the same faunal region are as follows: typical *cordata* Esch., *rotundipennis* Lec., *patulicollis* Blais. and *verrucula* Blais.

Oregona is to be recognized by its ovate form and dull luster. It is moderately robust and the elytra are quite circular, appearing slightly inflated. It is further distinguished by the moderately oblong-oval form of the male; the dull luster; the elytra narrower oval with sides more parallel; the pronotum transverse; the lateral margins broadly arcuate, most strongly so in middle third, less so posteriorly, but never broadly sinuate behind the middle where the margin is simply less arcuate or a little straighter; the sinuation feeble, strongest just before the small basal constriction and angles; humeri obsolete. The pronotal and elytral sculpturing is similar to but less coarse than in typical *cordata* Esch. where the pronotal lateral margins are obtusely subangulate at middle and distinctly more or less broadly sinuate behind the middle to the constricted base; the humeri are more or less obtusely angulate.

Rotundipennis Lec. is a smaller species and rather less robust, varying considerably in size and body form; the luster is more or less shining; the pronotal sides are distinctly more oblique behind the middle, more constricted at base and the angles more rectangular.

Patulicollis Blais. of the Parvicollis Group may occur with *oregona*. The species is oblong-oval in form, sometimes feebly subovate when the pronotum is less transverse; surface luster dull, the pronotum and elytra less convex; sides of the pronotum evenly arcuate to very near the base, the latter scarcely constricted; the pronotal surface less coarsely and densely punctate, punctures distinct, feebly impressed with intervals flat. Habitat: near Lake McElroy, Baha, Washington. One specimen came to hand with the series of *oregona* from the type locality.

Verrucula Blais. has the sides of the pronotum distinctly obtusely angulate, the disk very densely punctate, punctures quite equal in size; elytra densely tuberculate.

TINGITIDÆ FROM AMBOINA ISLAND

(Hemiptera)

BY C. J. DRAKE AND M. E. POOR

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The present paper is based upon a small collection of lace bugs from Amboina, Amboina Island, Molucca Islands, East Indies, presented to the California Academy of Sciences by the late F. Muir. This collection contains fifteen specimens, distributed among five genera and six species. Two genera and five species are described below as new to science. The types of all the new species are in the California Academy of Sciences.

Diconocoris javanus Mayr

Diconocoris javanus Mayr, Verh. Zool.-Bot. Ges. Wien, 15:442, 1865.
Diconocoris javanus, Drake, Lingnan Sci. Jour., 16:386, figs. 1, a and b, 1937.

One male specimen from Amboina agrees pretty well with the original description and also with the type as figured by Drake. It is a very large and striking species of a brownish black color. The costal area of the elytra is rather broad with the nervures dark brown to dark fuscous and most of the heavy transverse nervures black; some of the areolæ along the inner margins are clouded with brown to fuscous, the others hyaline. The legs are slender, testaceous, the tarsi brown.

Cysteochila aspera Drake and Poor, new species

Brown, the elytra with indication of median band and a transverse spot a little before apex, fuscous. *Head* with five rather short spines, the median longest and directed downward, the hind pair appressed. *Rostral channel* deep, not very wide, the rostrum brown, extending a little beyond mesosternum. *Antennæ* moderately long, indistinctly pilose, brown; segment I short, much stouter but not much longer than II; III very slender, almost three times as long as IV, the latter fusiform. *Legs* brown, rather slender and fairly short. *Pronotum* tricarinate, the strongly developed paranota sharply reflexed and meeting above disc so as to conceal all the dorsal surface save hood and triangular process; hood small, the front margin faintly produced; paranota very large, extending considerably above disc of pronotum, with strongly developed, bulbous, lateral humeral projections; lateral carinæ foliaceous, uniseriate, slightly converging posteriorly,

marginal veins thick; median carina more strongly raised, much higher on disc, there the paranota resting on it; triangular process areolate, the carinæ hairy. *Elytra* considerably longer than abdomen, the sides nearly parallel, strongly overlapping and jointly rounded behind when at rest; costal area moderately wide, biseriate, the areolæ moderately large; subcostal area a little wider, biseriate; discoidal area very long, wide, extending considerably beyond middle of elytra, pointed and slightly raised at apex, widest at middle, there six to seven areolæ deep, the inner boundary raised and obtusely angulate between middle and apex; sutural area large, more closely reticulated. *Genital segments* of male very broad. Hypocostal ridge biseriate at base, becoming uniseriate posteriorly. Length, 3.60 mm.; width, 1.37 mm.

Holotype, male, No. 5197, Calif. Acad. Sci., Ent., Amboina. The prominent lateral protuberances of humeri, the carinæ, paranota and broad male genital segments are distinguishing characters. The costal margins of the elytra are reflexed along the basal three-fifths.

Orotingis Drake and Poor, new genus

Pronotum convex, coarsely pitted, unicarinate; hood wanting; paranota not expanded or areolate, represented by a very narrow, carina-like ridge; collar present, truncate in front. *Head* short, without spines, the eyes large. *Antennæ* rather slender, segment I rather short, a little stouter and longer than II; III not much slenderer than other segments, scarcely longer than IV. *Bucculæ* short, open in front. *Rostral channel* very broad on meso- and metasternum, the laminæ low, rostrum rather long. Antenniferous tubercles inconspicuous. Orifice present. *Elytra* very broad, the outer marginal nervure strongly costate, costal and sutural areas widely reticulated, each distinctly defined; subcostal and costal areas more closely reticulated, the boundary between them not clearly defined, the pronotum and reticulation of elytra without vestiture.

Type of genus: *Orotingis muiri* Drake and Poor, n. sp.

This genus seems to be most closely allied to *Eteoneus* Distant, but is easily separated from it by the long fourth antennal segment. In *Eteoneus* the fourth antennal segment is much shorter and the areas of the elytra are sharply set off from each other.

Orotingis muiri Drake and Poor, new species

Head black, almost flat above, the eyes very large and blackish. Antennæ moderately stout, testaceous, indistinctly hairy; segment I moderately long, faintly embrowned at base, about one and one-

half times as long as II, the latter slenderer and rather long; III straight; IV very long, clothed with longer and more numerous hairs, faintly stouter, subequal in length to the preceding. *Rostrum* extending almost to base of mesosternum; channel widest on mesosternum, there with the sides concave within, slightly narrower and cordate on metasternum. *Pronotum* strongly convex, truncate in front, black, shiny, the pits very large; triangular process moderately large, somewhat brownish, the pits small, somewhat rounded at apex; median carina sharply raised, thick, non-areolate; paranota represented by an inconspicuous carina; collar cylindrical, not elevated. *Elytra* very broad, sharply widened at base, widest opposite apex of triangular process; costal area very broad, the outer nervure very thick, biseriate at base and in widest part, triseriate in transverse band, a small spot at base, a wide band in front of middle and apical portion dark fuscous (including areolæ), the rest pale testaceous with clear areolæ, the areolæ in widest part very large; discoidal and sutural areas dark fuscous, the nervures separating them not clearly defined, the areolæ of sutural area with centers pale and hyaline. *Legs* rather slender, pale testaceous. Length, 2.60 mm.; width, 1.65 mm.

Holotype, male, No. 5198, allotype, female, No. 5199, Calif. Acad. Sci., Ent., and one male and two female paratypes, Amboina, January, 1908.

In some specimens the third and fourth antennal segments are subequal in length. The discoidal area extends faintly beyond the middle of the elytra and is four areolæ deep in widest part.

Cottothucha Drake and Poor, new genus

Head short, without spines. Bucculæ contiguous in front. Orifice present. *Rostrum* moderately long; rostral channel very wide on metasternum, the laminæ not meeting behind. Antennæ long, slender; segments I and II short, the latter shorter; III very long, slenderest; IV long, slightly thicker than III. Antenniferous tubercles not prominent, small. Elytra considerably longer than abdomen, divided into the usual areas, without inflations. Pronotal cyst extremely large, not divided, concealing base of head and most of pronotum, except small portion of lateral margins and tip of triangular process. Reticulations distinctly lacy.

Type of genus: *Cottothucha oceanæ* Drake and Poor, n. sp.

This genus differs from *Idiocysta* China in having a differently formed and undivided hood or cyst, no visible lateral carinæ on triangular process and foliaceous paranota reflexed against the sides of the cysts. In *Idiocysta*, the paranota form the semiglobose hoods.

Xenotingis Drake and *Holophygdon* Kirkaldy have hoods of a different type and different derivation. *Alloithucha* Drake has widely expanded elytra with apices separated when at rest. The origin and structure of the pronotal hoods and cysts of the above genera and other genera need to be studied, but it is difficult to secure material in most of these genera for dissection and morphological studies.

Cottothucha oceanæ Drake and Poor, new species

Head short, black, almost flat; eyes large, blackish. *Rostrum* testaceous, extending to base of mesosternum. *Rostral channel* deep and parallel-sided on mesosternum, becoming very wide with the laminæ flaring and more widely areolate on metasternum, the laminæ not meeting at middle posteriorly. *Legs* slender, pale testaceous, the tarsi brownish. *Antennæ* long, slender, indistinctly pilose, pale testaceous; segment I not very long, stouter and twice the length of II; III very slender, straight; IV long, slightly thickened, seven-tenths the length of III. *Pronotum* black, almost totally concealed by the hood; hood extremely large, extending truncately over base of head as viewed dorsally, dark fuscous, with the veinlets darker, the median nervure a little more prominent than others, longer than high, strongly inflated, higher than wide; paranota strongly foliaceous, reflexed back against the sides of the hood, practically projecting vertically, biseriate, the areolæ large. *Elytra* rather narrow with subparallel sides, slightly constricted beyond middle, jointly rounded behind, dark fuscous, the widest part of costal and bordering portion of subcostal areas testaceous, there the areolæ hyaline; costal area reduced to a costate nervure along the basal portion, with five or six large areolæ distally (opposite apex of discoidal area); subcostal area narrow, uniseriate; discoidal area extending to middle of elytra and almost to end of abdomen, widest a little beyond middle, there four areolæ deep; sutural area large, the areolæ moderately large, some of them with pale centers. Hypocostal ridge uniseriate. Length, 3.00 mm.; width, 1.94 mm.

Holotype, male, No. 5200, allotype, female, No. 5201, Calif. Acad. Sci., Ent., and one male paratype, Amboina, November, 1907.

Stephanitis amboinæ Drake and Poor, new species

Large, broad, pale testaceous, some of the nervures embrowned. *Antennæ* long, slender, testaceous, shortly pilose; segment I moderately stout, long, narrowed distally to near the apex and then enlarged, five times the length of II, the latter short; III slender,

moderately long, nearly straight; IV very long, very slightly enlarged, three-fourths of the length of III, slightly embrowned. *Rostral channel* widening distally, the rostrum extending to middle of metasternum. *Head* concealed by hood, the spines whitish, rather short and directed forward. *Legs* slender, testaceous, the tips of tibiæ and tarsi embrowned. *Pronotum* dark brown, covered with a white exudation, slightly convex; hood very large, inflated, constricted in front of middle, extending considerably in front of head, about one and one-third times as long as high; median carina strongly foliaceous, nearly as high as hood, and a little shorter, the dorsal margin rounded; lateral carinæ short, not extending back onto triangular process nor forward beyond highest part of disc, high, each composed of two or three rectangular areolæ; triangular process narrow, membranous, reticulated; paranota large, reflexed, recurved in front and behind, the outer margin nearly straight and parallel, composed of several irregular rows of moderately large areolæ. Elytra with outer margin strongly sinuate, widened to beyond the middle, the tips somewhat narrower and widely separated; tumid elevation sharply raised, moderately large, impressed within, subcostal portion convex, discoidal area partially concave and merging with sutural area without distinct differentiation. Reticulation of paranota, hood, carina and elytra partly embrowned, the areolæ moderately large, the margins of elytra and paranota with short, fine hairs. Length, 4.18 mm.; width, 3.10 mm. at widest point of elytra.

Holotype, female, No. 5202, Calif. Acad. Sci., Ent., Amboina, November, 1907.

The short, high lateral carinæ and very strikingly shaped paranota and elytra are distinguishing characters. The crest of the tumid elevation is the boundary between discoidal and subcostal areas, the former occupying the inner portion; the boundary between discoidal and sutural areas is not definitely defined. It is not easily confused with its congeners from the East Indies.

Stephanitis astralis Drake and Poor, new species

Moderately large, pale testaceous, some of the veinlets embrowned, *Antennæ* long, slender, testaceous, shortly pilose; segment I moderately long, rather swollen at ends, not quite four times as long as II, the latter short; III very long, nearly straight, about two and three-fourths times as long as IV, IV moderately long, slightly enlarged. *Rostral channel* deep, widening distally, the laminæ testaceous; rostrum stout, testaceous, dark at apex, extending beyond middle of metasternum. *Legs* testaceous, the tips of tibiæ and tarsi embrowned. *Pronotum* brown, unicarinate, moderately convex, triangular portion narrow, membranous,

areolate; hood rather small, very narrow, extending forward slightly beyond apex of head and backward not as far as highest part of disc; median carina strongly foliaceous, long, a little higher than hood and more than twice as long when measured on dorsal edge, biseriate, the areolæ large; paranota wide, long, nearly rectangular in outline, reflexed, posterior margin curved inward, triseriate, the areolæ large. Elytra broad, the tips separated but not widely, the tumid elevation long, high, impressed within, extending barely beyond middle of elytra. Transverse veinlets of marginal row of areolæ, paranota and elytra embrowned, also a few of the other veinlets; areolæ hyaline, the discoidal area quadriseriate, evenly concave, occupying the inner slope of tumid elevation and truncate behind; subcostal area biseriate, almost vertical; sutural area biseriate at base, triseriate beyond. Length, 3.50 mm.; width, 2.10 mm.

Holotype, male, No. 5203, allotype, female, No. 5204, Calif. Acad. Sci., Ent., and two paratypes, Amboina, November, 1907.

The long median carina and long tumid elevation of elytra are distinguishing characters. The costal area of elytra is wide, triseriate to widest part, there the areolæ are a little smaller and five deep.

SOME ADDITIONAL INTERSEXES IN MEGACHILE*

(Hymenoptera, Megachilidæ)

BY THEODORE B. MITCHELL

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Since the publication[4] several years ago of descriptions of a number of sexually anomalous specimens of leaf-cutter bees (*Megachile*), several additional specimens have been discovered and are herewith reported and described.

MEGACHILE (DELOMEGACHILE) VIDUA Smith, Intersex

The head and thorax of this specimen are entirely male in character, the antennæ being 13-segmented, the anterior tarsi broadly dilated, and all other secondary sex characters just as in a typical male. The more basal segments of the abdomen, also, seem to be more male in character, for the pubescence is entirely pale on the first three basal terga, whereas in females the second and third have conspicuous dark pubescence across the discs. The terminal segments are more definitely female, although the apical fasciæ are much narrower than in the female, and the sixth tergum is less broad, with finer puncturation. The venter of the

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abdomen has six exposed sterna, all of which are smooth and impunctate, although tessellate, and are entirely devoid of pubescence or scopal hairs, except for a few on the sixth sternum.

Nordegg, Alberta, July 5, 1926, (E. H. Strickland) [Univ. of Alberta].

This is the third intersexual specimen of this species to be found, and all three were collected in Alberta.

MEGACHILE (CHELOSTOMOIDES) ANGELARUM Cockerell, Intersex No. 1

The head and thorax are preponderantly male in character, but with a slight degree of femaleness evident. The antennæ are both 12-segmented, as in the female, but the pedicel resembles that in the male, being about intermediate in length between the first and second segments of the flagellum. In the female, this is about as long as both of these segments combined. The upper part of the clypeus, also, seems to be slightly female in character, having the puncturation somewhat more coarse and deep than in most males, with the surface slightly more exposed by the thinner pubescence. The mandible and cheeks seem to be entirely male, and on the thorax, the legs are quite definitely male. The abdomen seems to be more distinctly female, with six exposed sternal plates, a fairly well developed scopa and a sting. The scopa partakes somewhat of the male in that it tends to be decumbent and is composed of finer and slightly plumose hairs, and is more sparse laterally.

Pine Valley, San Diego County, California, August 1, 1927 (F. W. Kelsey) [San Diego Mus.].

MEGACHILE (CHELOSTOMOIDES) ANGELARUM Cockerell, Intersex No. 2

This specimen is very nearly identical with the preceding one, answering to the description in all essential details, and showing only minor differences. The upper portion of the clypeus is somewhat more closely and finely punctate, being thereby a trifle more male in character than in the other specimen, but the front tarsi are not quite so broadly dilated as in that specimen, hence are not quite so distinctly male in character. The antennæ, mandibles and abdomen seem to be very similar in the two specimens.

Twain-Harte, Tuolumne County, California, 4,000 feet, July, 1937 (F. E. Blaisdell) on *Grindelia* [Calif. Acad. Sci.].

MEGACHILE (PSEUDOCENTRON) CURVIPES Smith, Intersex

The thorax and legs are entirely male in character, showing no evident differences from the condition in a normal male. The head, however, is to a degree intermediate. The mandibles are quite

distinctly of the female type, but the teeth are slightly modified from the condition in a typical female. The face is slightly broader than in the male, and the pubescence on the upper portion of the clypeus is intermixed light and dark, instead of being conspicuously black as in the male. The pubescence of the lower portion is dense enough to hide the surface, but is not quite of the male type. The clypeus is thus about intermediate between the typical male and female condition. The apical joints of both antennæ are missing, and since the basal portions of these appendages are not markedly dimorphic, we cannot determine their condition.

The basal portion of the abdomen seems to be slightly more male than female in character, although dimorphism here also is slight and differences are thus harder to detect. Six sterna are at least partially exposed, the fifth being in large part hidden under the fourth, but this is due apparently to the position of the abdomen rather than to any modification of the plate. The sterna are largely devoid of a scopa, but the apical margins of the second to the fifth are fringed with long thin pubescence, much as in the male. The sixth is largely bare, with a short subapical fringe and sparse hairs basally and laterally, which is typical of females in the subgenus *Pseudocentron* to which *curvipes* belongs. The second to fifth terga have conspicuous entire yellow apical fasciæ, as in females of *fossoris*, but the disc of the fifth is covered with short thin greyish tomentum and longer erect hairs which are pale in general, with but a few intermixed dark hairs. The sixth tergum has entirely pale pubescence, this partly as appressed tomentum and partly erect hairs. This condition of the fifth and sixth terga does not agree with the condition in *M. fossoris* Smith, which I have thought to be the female of *curvipes*, but because of the anomalous character of this specimen we are not warranted probably in arriving at any positive opinions on this point.

S. Geronimo, Guatemala (Champion) [Brit. Mus.; Godwin-Salvin coll. 1911-24].

MEGACHILE (ARGYROPILE) PARALLELA Smith, Intersex

This specimen is male in large part, entirely so in both head and thorax. The abdominal terga, also, seem to be quite male in character, but the sixth is definitely female, and a sting protrudes between it and the sixth sternum. The other abdominal sterna are female in general form, lacking any of the modifications characteristic of the male, but the scopa is very thin and poorly developed.

Twain-Harte, Tuolumne County, California, 4,000 feet, July, 1937 (F. E. Blaisdell) on *Grindelia* [Calif. Acad. Sci.].

This is the second intersexual specimen of this species to be collected.

MEGACHILE (LITOMEGACHILE) ONOBRYCHIDIS Cockerell, Intersex?

This is a quite normal female in all respects but one, that being a degree of density of the pubescence on the clypeus which is not found in the female of this species, but is characteristic of the male. Beneath this pubescence, the surface of the clypeus is somewhat more finely punctured than in the normal female.

Lompoc, California, August 6, 1938 (Joan Russell) [Univ. of Kansas].

All of these specimens are considered to be intersexes rather than gynandromorphs, and the causes of their occurrence are quite probably physiological rather than genetic. Space will not be taken here to discuss the various facts and theories of sex determination. These were briefly summarized in the paper on sex anomalies[4], and for more complete information reference should be made to the works of Goldschmidt[2] or Crews[1]. A somewhat more recent work by Goldschmidt[3] reviews all of this information.

Two apparent gynandromorphs have been described in this genus, one of *M. willughbiella* Kirby by Stenton[6], and another of *M. latimanus* Say by myself[5]. In this latter specimen the right side is female and the left male, with the line of division between the two remarkably definite and distinct. Such conditions are considered to be due to genetic upsets, and are in sharp contrast with the conditions in the specimens described here. These are probably genotypic females which have had maleness impressed upon them in varying degrees, depending upon the length of time during development in which the causal factors have been operative. Of these six specimens, those of *vidua* and *parallela* are the most completely male in character, and it is likely therefore that a change in direction of development from femaleness to maleness occurred earlier in those specimens than in any of the others. In the case of the specimen of *onobrychidis*, it is evident that the change of direction occurred very late.

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[2] Goldschmidt, R. A further contribution to the theory of sex. Jour. Exp. Zool., 22:593-611, 1917.
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[5] Mitchell, T. B. A gynandromorph of Megachile latimanus Say. Jour. Elisha Mitchell Soc., 47:52-54, 1932.
[6] Stenton, R. Gynandromorphism of Megachile willughbiella. Ent. Mag., 45: 188, 1909.

THREE NEW GENERA OF APTEROUS ARADIDÆ
(Hemiptera)

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The recent discovery of apterous Aradidæ of the genus *Chelonocoris* Miller* was a most remarkable advance in our concept of this group of insects. Localized geographically and exhibiting such remarkable characters, it was unhesitatingly made the type of a new subfamily, Chelonocorinæ. Now we find that a new genus, *Notoplocoris,* disrupts the geographical picture and a new genus, *Emydocoris,* destroys any structural homogeneity which the Chelonocorinæ may once have had. The nymphs of *Notoplocoris,* furthermore, link this form with typical Mezirinæ. Indeed, the genus *Barcinus* Stål, with long first antennal segment, strongly produced juga, and laterally located eighth segment stigmata, suggests a possible direct ancestor for *Chelonocoris* and *Phyllotingis* Walker suggests such an ancestral form for the American *Notoplocoris. Emydocoris* was very likely derived by aptery from a *Mezira*-like ancestor. Thus a polyphyletic origin of the apterous Aradidæ is indicated and the subfamily Chelonocorinæ is no longer tenable.

The present case throws light on the general problem of pterygopolymorphism in the Heteroptera. The Aradidæ are now known to exhibit brachyptery (*Mezira, Aradus*), stenoptery (*Aradus*) and aptery (*Chelonocoris, Notoplocoris, Emydocoris, Chelonoderus*). Such phenomena are commonplace in the Gerridæ and Veliidæ and are accompanied by equally remarkable structural modifications, particularly those correlated with wing development, *e.g.* thoracic modifications. Although a few Veliidæ and Gerridæ (*Trochopus, Halovelia* and *Halobates*) are permanently apterous, many others exhibit all degrees from macroptery to aptery within a single population.

The modern conception of hormone control of development suggests that apterous forms which retain many nymphal structures but which have fully developed reproductive organs may represent cases of arrested or retarded development of one set of organs. This is certainly less remarkable than the complete

* Miller, N. C. E. 1938. A new subfamily of Malaysian Dysodiidæ. Ann. Mag. Nat. Hist. (11) 1:498-510, 7 figs.

neoteny exhibited by larviform females of Lampyridæ or the pædogenesis which occurs in *Micromalthus*, the Cecidomyidæ, and in a few other groups.

Key to the Apterous Genera of Mezirinæ (Chelonocorinæ Miller)

1. Pronotum narrow, gradually constricted anteriorly where it is narrower than head. First antennal segment as long or longer than head. Antenniferous tubercles scarcely produced. Oriental ..... *Chelonocoris* Miller
–. Pronotum with well developed antero-lateral angles across which it is broader than head. First antennal segment shorter than head. Antenniferous tubercles well developed 2
2. Head subquadrate, with large subangular lobes behind the eyes. Body surface entirely naked. Connexival segments not produced, even on seventh segment. Neotropical. *Emydocoris*, n. gen.
–. Head subtriangular, strongly narrowed behind the eyes. Body surface at least partially clothed with short, thick, appressed hairs. Connexival segments briefly arcuate posteriorly, the sixth and seventh segments more strongly produced into distinct lobes 3
3. Juga slender, subparallel, subacute at apices, not reaching middle of first antennal segment. Metanotum produced laterad as a plate-like cover over base of connexivum. Neotropical. ..... *Notoplocoris*, n. gen.
–. Juga broad, dilated anteriorly, and feebly, obliquely emarginate at apices, reaching nearly to apex of first antennal segment. Metanotum confined within narrow connexival plates, not reaching lateral margins. Australian ..... *Chelonoderus*, n. gen.

Notoplocoris Usinger, new genus

Apterous, subtriangular in form, and irregularly clothed with erect or subappressed thick hairs. *Head* slightly longer than broad, strongly narrowed basally, without postocular spines; antenniferous tubercles prominent, divergent, acute; anterior portion of head reaching almost to middle of first antennal segment, the juga surpassing tylus by one-half their length, produced straight forward and tapering apically, forming a deep cleft between. *Antennæ* a little shorter than head and thorax combined, the first segment long, curved outward, stout, sparsely clothed with erect hairs, second segment slender, cylindrical and nude, half as long as first, third slender, cylindrical and wide, slightly longer than first, fourth shortest, pyriform, densely pilose on apical third. *Rostrum* not reaching base of head. *Pronotum* half again as wide as head across eyes, the sides roundly lobulate; meso and metanota progressively wider, produced laterally as rounded or subangulate lobes. Metasternal orifice channels visible from above between

meso and metanota. Meso and metanota without trace of wing pads, triangular scutellum absent. Trochanters distinctly separated from femora. *Abdomen* entirely exposed above, the terga forming a regular pattern of granules and plates. Connexival segments sinuate on their basal halves, briefly arcuately expanded on posterior halves, those of seventh segment produced as short, divergent lobes, rounded at apices, on either side of genital segment. Stigmata of all segments except eighth (genital lobes) located remote from lateral margins, genital lobes with stigmata placed on the sides and visible from above. Abdomen with sides concave to expanded seventh segment in male, oval in outline and broadest across sixth segment in female.

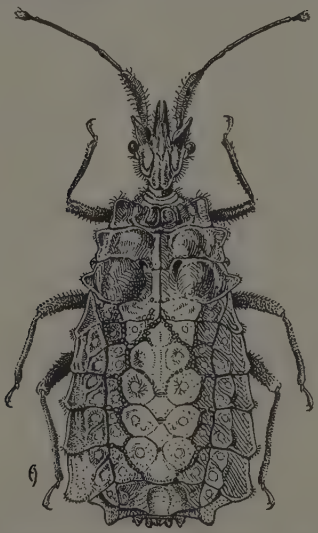

Figure 1. *Notoplocoris montei* Usinger, n. gen. and sp., female allotype.

Genotype: *Notoplocoris montei* Usinger, n. sp.

Suggestive of the Malay genus *Chelonocoris* Miller because of the apterous condition and plate-like pattern of the abdominal tergites. *Chelonocoris* differs in possessing relatively longer first antenal segments; a less deeply cleft apical process of head; shorter antenniferous tubercles; broader base of head with pronotum but little wider than head anteriorly and evenly widening posteriorly, without rounded lateral lobes on each thoracic segment; scuteller area rather distinctly indicated as a poste-

riorly produced triangular plate; connexival segments not roundly lobulate on their posterior halves, the seventh abdominal segment produced on either side of genital segments into long, rounded or subacute lobes; trochanters partially fused with the femora.

Notoplocoris montei Usinger, new species

(Figure 1)

Male. *Head,* one-fourth longer than broad across eyes, 50::39; apical process comprising about two-fifths of entire head length, the tylus extending about half of this distance, juga produced beyond apex of tylus for one-fifth of total length of head; juga tapering apically, their inner margins subparallel, forming a deep, narrow cleft; antenniferous tubercles very prominent, arising about at middle of head just in front of eyes and separated from apical process of head almost from their bases by deep clefts, broad on basal two-thirds, more attenuated and divergent on apical third beyond insertion of antennæ; eyes globular, small but strongly exserted, about one-sixth as wide as interocular space, 5::28; head strongly narrowed behind eyes, briefly angular immediately behind eyes, arcuately converging toward the middle of postocular region, less than half the width across eyes and subparallel at basal fifth, with a narrow, finely granular, constricted neck region at extreme base; upper surface roughened and polished except for a large smooth area laterally behind eyes; tylus moderately elevated, head with a broadly elevated median area, separated by ill defined depressions from lateral areas which are continuous with antenniferous tubercles and bear the eyes and antennæ; under surface convex, the under sides of antenniferous tubercles bulbous behind insertions of antennæ, apical process beneath tylus strongly convex; pubescence unevenly erect or subappressed except for smooth sublateral areas behind eyes, the lateral margins behind eyes with hairs on subangular prominence and two rows of closely placed hairs behind this. *Rostrum* inserted a little in front of middle and inside of a narrow slit in a strongly produced lobe; this apparently bilobed hood decreasing in elevation posteriorly to form the longitudinal carinæ of the rostral groove which join just before base of head; large, oblique wrinkles on either side of rostral groove; rostrum scarcely reaching end of rostral groove, its first segment very slender and located within the narrow cleft described above; terminal segments broader. *Antennæ* twice as long as head; proportion of segments one to four as 35:18:37:10; first segment seven-tenths as long as head, about half as thick as front femora, slightly narrowed basally, curved outward, beset with erect, stiff hairs; second and third segments about half as thick as first, cylindrical, with very short, sparse, appressed hairs.

Thorax subflattened above, the sutures between segments ill-defined. *Pronotum* on anterior two-fifths with two ring-like areas which bear dense erect hairs along their sides; widening abruptly posterior to this to one-fourth broader than head across eyes, the rounded lateral lobes a little elevated, bearing two rows of erect hairs along their edges anteriorly and numerous shorter hairs posteriorly; disk behind ring-like elevations with a narrow but deep impression longitudinally at middle, with posteriorly divergent elevated carinæ on either side of middle and irregular sublateral carinæ beyond subdepressed areas; posterior margin straight laterally, moderately convex medially. *Mesonotum* almost half again as broad across lateral lobes as across pronotal lobes, 75::55; lobes subroundly produced anteriorly, narrowed posteriorly; disk with a feebly developed median longitudinal elevation which is finely impressed along its middle; disk moderately elevated laterally at middle and strongly depressed into a broad deep pit on either side of middle at posterior margin and extending onto metanotum; posterior margin ill-defined at middle a little behind these impressions, then turning forward through the pits and extending as a concave arch to lateral margin at ostiolar cleft. *Metanotum* short, about half as long on median line as mesonotum, produced laterally as a narrow, plate-like lobe with rounded apex, the width across these lobes one-fourth greater than greatest width of mesonotum; metanotal disk with a finely impressed line along middle, feebly depressed on either side of middle behind deep anterior pits and broadly convex sublaterally; posterior margin very ill-defined, transverse at center, concavely sinuate on either side of middle and broadly convex sublaterally. *Ostiolar canals* produced outward as short, rounded lobes on either side between meso and metanota.

Abdomen with first segment visible only from above, practically fused with metanotum anteriorly, about as long as metanotum on median line and traversed by a continuation of the finely impressed longitudinal thoracic line; disk elevated at middle and sublaterally, with a subtriangular plate on either side cut off from abdominal margin by the connexival plate of second abdominal segment; broad, transverse areas on either side of middle bounded medially and anteriorly by low, rounded tubercles which are irregularly spaced. Main disk of abdomen sharply divided sublaterally by a deeply impressed suture into a broad lateral connexival area and the central abdominal tergum which is about three times as wide as connexivum. Connexival margins feebly concave on anterior portion of each segment, briefly, roundly produced on posterior fourth into small rounded lobes which increase in size from anterior to posterior segments and each of which bears a tuft of thick pale hairs. Sixth connexival segment strongly produced, the distance across expanded, angulately rounded lobes one-eighth greater

than greatest width across metathorax. Seventh connexival margin more narrowly produced, the lobes produced postero-laterally on either side of genital segments and rounded apically, not reaching level of tip of genital segments. Disk of each connexival segment except the subtriangular second segment, divided into an outer homogeneous half which is subdepressed posteriorly, and an inner half which is further subdivided by an oblique impressed line into two subtriangular areas, each with a paler, smooth rounded area at its center. Most of connexivum with short, subappressed hairs but with a tuft of longer, suberect hairs at middle of posterior margin of segments III to VI. Tergal plates likewise further subdivided, segments two to seven each with a pair of lateral smooth areas opposite those of connexival segments, each pair of cells slightly depressed, bounded along their inner margins by rows of rounded tubercles and each cell with a pale round spot at center. Central areas of tergites delimited by sutures or rows of tubercles or both and bearing a rounded smooth area at the middle of each side. Second segment composed of two subtriangular plates, one on either side of the anteriorly produced third segment which is broadly joined to first segment at middle. Third segment nearly half again as long as broad, very feebly longitudinally impressed along middle of anterior half, bounded along anterior and lateral margins by rounded tubercles, depressed a little behind middle and elevated at narrow transversely rugose posterior margin where the first dorsal abdominal scent gland opening is present. Fourth segment deeply emarginate anteriorly to receive the posteriorly produced third segment, roundly arcuate and bounded by tubercles laterally, slightly less strongly produced backwards than third segment, the narrow posterior tip finely transversely rugose and bearing the second scent gland at its apex. Disk on either side of produced third segment slightly depressed and bearing numerous long, subappressed hairs. Fifth segment likewise deeply notched for the reception of the posterior projection of fourth segment, subrounded and bounded laterally by rounded tubercles, posterior margin less strongly and more narrowly produced and slightly raised apically at middle at the third abdominal scent gland. Sixth segment nearly straight along posterior margin. Seventh segment strongly elevated and broadly concave at middle. First genital segment ring-like but longest at middle, produced on either side of second genital segment as knob-like genital lobes which do not reach level of apex of second segment. Second genital segment strongly convex, subrounded posteriorly with a broad, attenuated process dorsally which is curved downward apically. Genital segments and areas adjoining, clothed with thick pale hairs.

Under surface sparsely clothed with short, subappressed, pale hairs with a series of longitudinal subtriangular or oval smooth

areas along middle, one each on mesosternum, metasternum, and abdominal segments one to six. Abdomen with three rows of smooth round areas, the outermost row on ventral portion of connexivum. Spiracles of all but the eighth segment ventral, located about half way between sublateral longitudinal suture and lateral margin. Spiracles of eighth segment located laterally on the edges of strap-like posterior processes. Trochanters distinct. Femora moderately incrassate, without stout spines or processes. Legs clothed with erect or subappressed, thick pale hairs.

Color generally brown with ferrugineous disk-like areas, rostrum, trochanters, and ostiolar grooves, fulvous tarsi and testaceous pubescence.

Female. Similar to male but with the abdomen broader, the connexival margins forming an oval outline in contrast to the concave outline with posterior dilation of the male. Female abdomen widest across dilated portions of fifth segment, nearly as wide at this level as long. Sixth abdominal tergite strongly elevated at middle of posterior half, seventh tergite broadly elevated at middle with an arcuately rugose depression in the elevated area. Seventh segment produced postero-laterally on either side of genital segments as apically rounded lobes which do not attain level of apices of genital segments. First genital segment produced on either side of median process as subacute lobes, each bearing a spiracle on its outer edge which is visible from above. Median process reaching about to level of lobes of first genital segment, the genital valves slightly exceeding central oviduct.

Size: male, length 10.3, width (abdomen) 4.6 mm.; female, length 12 mm., width (abdomen) 5.5 mm.

Holotype, male, No. 5222, Calif. Acad. Sci., Ent., allotype, female, No. 5223, Calif. Acad. Sci., Ent., and one male and one female paratype, Angra, Estado Rio de Janeiro, Jussaral, October, 1935 (L. Travassos et Lopes).

Two nymphs of indeterminate instar are 8½ and 9 mm. in length and 4 mm. wide. They are very similar to nymphs of the genus *Mezira*, differing chiefly in the different antennal proportions (as described above for the adults), strongly produced juga, lack of mesonotal and metanotal wing pads, and lateral position of the spiracles of eighth abdominal segment. Most significant similarities to *Mezira* are the presence of postocular spines (absent in adult *Notoplocoris*) and nearly identical arrangement of thoracic and abdominal plates and depressed areas into a pattern which appears to be basic for the Mezirinae and which is certainly the precursor of the arrangement seen in adult *Notoplocoris*.

Emydocoris Usinger, new genus

Apterous, elongate-oval in form, convex below with a complicated pattern of pits and elevations above; surface in great part naked. Head subquadrate, as long as wide across the eyes, with sides subparallel, eyes only slightly protruding. Anterior portion of head relatively short, about one-third of total head length, juga surpassing tylus and contiguous beyond it, moderately dilated apically. Antenniferous tubercles relatively short, extending only about one-third the length of median portion of head, scarcely dilated apically, the outer side nearly parallel. Eyes longer than broad. Postocular portion of head dilated into thick lobules which complete the subquadrate outline. Rostrum short, not reaching posterior limits of deep rostral sulcus. Antennæ short, one-third longer than head, the first segment thickest, curved outward, second segment a little enlarged apically, shortest, one-third shorter than first, third segment longest, cylindrical, half again as long as first, fourth segment a little shorter than first, with a pyriform shape due to the great thickening subapically, densely pubescent apically.

Pronotum about three times as broad as head, strongly, roundly elevated at sides, narrowed to a depressed collar anteriorly, not produced laterally into lobes. Mesonotum short and roundly elevated laterally but scarcely produced laterally over ostiolar canals. Metanotum not reaching lateral margins, fused posteriorly with first abdominal segment. Meso and metanotal disks deeply pitted laterally, without trace of wing pads and without triangular scutellum. Trochanters distinctly separated from femora.

Abdomen entirely exposed above, elevated medially, depressed and lobulate sub-laterally, the broad connexival margins elevated laterally, the margins feebly rounded forming the subrounded contours of abdomen which are uninterrupted by lobes or processes except for genitalia. Stigmata of all but eighth abdominal segment located remote from lateral margins at or near the middle of their respective segments. Spiracles of eighth segment (genital lobes) located postero-laterally on the short lobes.

Genotype: *Emydocoris testudinatus* Usinger, n. sp.

Suggestive of *Mezira* in shape of anterior portion of head, antennæ, location of abdominal spiracles, and in female genitalia. Differing in the absence of postocular spines and in the apterous condition and remarkable arrangement of plates dorsally. *Emydocoris* differs from the other apterous Aradidæ thus far described in the subquadrate head with broad postocular

portion and in its non-lobulate thoracic and connexival angles and its glabrous body surface.

Figure 2. *Emydocoris testudinatus* Usinger, n. gen. and sp., female holotype.

Emydocoris testudinatus Usinger, new species

Female. *Head* slightly longer than broad across eyes, 37::34; apical process comprising about one-third of entire head length, the tylus extending only about half this distance, the juga contiguous beyond this, dilated into large rounded lobes apically; antenniferous tubercles short, the distance from front margin of an eye to apex of antenniferous tubercle equal to length of an eye; tubercles feebly anteriorly divergent and blunt at apices; eyes suboval, about two-thirds as broad as long, extending about one-third of their width beyond sides of head, about one-third as wide as interocular space, 7::20; postocular portion of head broad, the postero-lateral lobes depressed sublaterally, thickened laterally, the posterior angles subrounded, nearly touching pronotal collar. *Antennæ* slightly longer than head, 42::37; proportion of segments one to four as 10:8:14:10. *Rostrum* very short, less than half as long as head, 17::37; proportion of segments one to four as 2:3:5:7; rostral groove narrow and swollen anteriorly at base of rostrum, broad and very deep behind base, the strongly elevated sides of trough continuing around posterior end to completely enclose trough.

Pronotum two and one-half times as broad as long, 52::20; widest posteriorly, the sides thickly rounded and strongly elevated, antero-lateral angles broadly rounded, depressed toward the middle, anterior margin depressed and forming a smooth collar; disk

with an oblique rounded carina sublaterally near each antero-lateral angle, then with a deep collar to just within postero-lateral angles; with a broad oblique elevation on either side of middle, terminated by a small transverse carina just before collar and separated by a very deep median suture or fossa which widens and becomes shallower posteriorly to feebly elevated posterior margin. *Mesonotum* three times as broad as long, 60::18; longest at middle where it is nearly as long as pronotum, 18::19; disk briefly roundly elevated laterally over ostiolar canals, with a deep oblique pit on either side of middle, the sides of pit produced on either side as rounded tubercles with apices subcontiguous; middle of disk strongly elevated and feebly, longitudinally impressed; posterior margin strongly sinuate, straight at middle, bent strongly forward and then outward behind pits, and then again curved forward sublaterally just before connexivum. *Metanotum* fused with first abdominal segment.

Abdomen with disk separated into the usual connexival, subconnexival, discomarginal, and discal areas, the entire disk elevated along middle and depressed sublaterally along sutures which separate connexivum from disk; connexivum of first and second segments fused, very long, extending forward to lateral lobes of mesonotum; connexival segments with long, shallow depressions sublaterally, the third to sixth segments with ill-defined plate-like areas on inner half; disk of abdomen with a deep oblique pit laterally at base on either side of metanotum, the anterior and posterior margins of each pit roundly produced and nearly contiguous; marginal discal area of third to sixth segments depressed in the form of ovals, the posterior margins of third to fifth segments with an inner and outer tubercle converging with their apices nearly contiguous behind each depressed area; third segment longest, as long at middle as the remaining segments of disk, with a rounded depression either side of middle on basal half; apex of third segment transversely wrinkled, fourth and fifth segments much shorter, likewise transversely wrinkled posteriorly; sixth segment broad with two longitudinal elevations at middle and a small rounded lobe on either side of posterior margin sublaterally.

Under surface convex, thoracic pleura wrinkled, abdominal segments each with a small dull spot at middle and with a pair of dull, depressed spots on either side of sublateral sutures. Bases of ventral abdominal segments with pits and tubercles alternating across their entire width. *Genital lobes* very short, the terminal median lobe more prominent. Ventral plates strongly longitudinally wrinkled.

Color uniform brownish ferrugineous, the eyes, apices of antennæ, and tarsi paler, testaceous.

Size: female, length 8 mm., width (abdomen) 4 mm.

Holotype, female, No. 5224, Calif. Acad. Sci., Ent., Angra, Estado Rio de Janeiro, Jussaral, October, 1935 (L. Travassos et Lopes).

Figure 3. *Chelonoderus stylatus* Usinger, n. gen. and sp., male, holotype.

Chelonoderus Usinger, new genus

Apterous, elongate-oval in form, and clothed over most of the body with appressed, thick hairs. Head nearly as broad across eyes as long, 52::60, strongly narrowed behind the eyes into a slender neck region without postocular tubercles or spines. Anterior process comprising about one-third of total head length, narrowed at middle and feebly dilated apically with a small notch at middle of apex. Antenniferous tubercles long, divergent, subcylindrical, blunt at apex, reaching about to middle of first antennal segment. Eyes strongly exserted, suboval in form, located completely laterad of a line drawn from sides of antenniferous tubercles to sides of head at base. Antennæ slightly longer than head, the first segment thickest, curved outward, briefly surpassing apical process of head, second and third segments more slender, nearly cylindrical, fourth segment pyriform and pubescent apically.

Pronotum not quite one-fourth wider than head across eyes, the front margin depressed with a collar, sides strongly, roundly elevated, disk deeply pitted at middle with an irregular elevated lobe on either side of middle. Mesonotum wider, with a small lobe

above ostiolar opening, the disk depressed except for a large lobe on either side of middle and a median, longitudinally impressed elevation. Metanotum deeply, broadly impressed on either side of median elevation with the sides of oblique depressions lobulately produced and approximate at center. Third, fourth, and fifth connexival segments shallowly concave anteriorly and a little convex posteriorly, the sixth and seventh segments strongly lobed.

Stigmata located approximately at middle of ventral connexival plates on segments two to seven, those of eighth segment terminal. Trochanters distinct.

Genotype: *Chelonoderus stylatus* Usinger, n. sp.

Chelonoderus differs from the geographically neighboring species of *Chelonocoris* in its broad pronotum, well developed antenniferous tubercles, stylate eyes, and in the absence of a posterior prolongation of the mesonotum and posterior prolongations of the seventh abdominal segment. It is perhaps closest to the South American *Notoplocoris* but that genus lacks the dorsal pits and tubercles, has lateral metanotal lobes, and strongly produced styliform juga.

Chelonoderus stylatus Usinger, new species

Male. *Head* with upper surface roughly granular, tylus and paraclypeal lobes distinctly elevated, the disk of head with a deep pit on either side of this elevated area, the sides of pit extending as rounded tubercles toward each other at middle; constricted neck region about one-third as wide as head across eyes; juga subflattened, depressed, feebly dilated anteriorly, the apices broad and obliquely, shallowly emarginate, the entire apical process appearing feebly notched at middle because of divergent apices of juga. *Eyes* suboval in form, about one-seventh as wide as interocular space. *Antennæ* slightly longer than head, 67::60; proportion of segments one to four as 23:13:19:12. *Rostrum* about half as long as head, the rostral groove deep and completely enclosed.

Pronotum slightly broader than length of head, 64::60, about two and one-half times as broad as long on median line, 64::26; anterior margin depressed, forming a ring-like collar with a pair of rounded tubercles on each side opposing rounded tubercles from elevated pronotal disk, the apices of opening tubercles approximate; lateral pronotal margins greatly swollen, strongly elevated, sinuate on outer margins, with a longitudinal impression separating off an inner higher lobe; depressed central portion of disk with a prominent lobe on either side of middle separated by a

deep median longitudinal pit; posterior margin narrowly depressed beneath overhanging discal lobes, moderately sinuate. *Mesonotum* very short and broad, only half as long as pronotum and one-third wider across ostiolar lobes than width of pronotum; disk unevenly elevated laterally at ostiolar openings, broadly depressed sublaterally, with a large lobe on either side of middle entirely surrounded by a deep depression; each lobe projecting backward and nearly meeting a lobe extending across from central elevated area of metanotum; middle of mesonotum with a strongly elevated, longitudinally impressed, carina which broadens posteriorly into metanotum. *Metanotum* about as long as pronotum, enclosed by the connexivum from lateral margins; discal elevation highest along middle, depressed sublaterally on posterior half, the sides strongy elevated and dilated posteriorly, overhanging and approximating a corresponding lobe on lateral discal elevation with a deep, smooth, oblique depression on either side beneath and between the opposing lobes.

Abdominal disk moderately elevated medially, the first, second and third segments fused; fused area elevated anteriorly at middle, depressed laterally with tubercles as described above opposing those of metanotum over lateral depression; fused elevated area about as long as thorax, with a pair of oval or elongate oval depressions on either side of middle and with posterior portion narrowed to glandular opening at posterior margin. Fourth and fifth segments relatively short at middle and gradually decreasing in elevation to posterior margin of fifth segment. Sides of disk with two depressed areas on third segment, three on fourth and fifth, and two on sixth, with opposing tubercles between fourth and fifth and between fifth and sixth segments. Connexivum roughly sculptured, the first two segments fused, extending forward as a slender tip reaching ostiolar openings. Hind margins of second and third connexival segments, at least, elevated. Sixth and seventh connexival segments distinctly lobulate laterally, the seventh segment strongly elevated at middle. Lobes of eighth segment extremely short, reaching only to middle of genital lobe, this median lobe likewise comparatively short, subcordate, not reaching level of apices of lobes of seventh segment. Under surface rugose and impressed much as in related genera. Color rather uniform brown with the rostrum and tarsi somewhat paler.

Size: Male, length 11 mm., width (connexivum) 5¼ mm.

Holotype, male, No. 5225, Calif. Acad. Sci., Ent., N. Queensland, Australia, October 4, 1920, J. A. Kusche collector.

A NEW SPECIES OF MYZUS FROM HUMBOLDT COUNTY, CALIFORNIA

(Homoptera, Aphididæ)

BY E. O. ESSIG

University of California, Berkeley

Myzus humboldti Essig, new species

A medium-sized bright to pale green and slightly pulverulent species feeding on the tips of the new growth and on the buds and flowers of western viburnum or bridal wreath, *Viburnum ellipticum* Hook., at Bishop Pine Lodge, two miles north of Trinidad, Humboldt County, California. It was collected by the writer on June 2, 1938.

Color. Green and pulverulent, the alates with dusky or black head, antennæ, thorax, cornicles, and cauda; three distinct circular dusky marginal areas in front of a larger irregular dark area at the base of each and two smaller marginal dark areas behind cornicles; three sub-lateral dorsal dusky patches, and two quite large somewhat transverse dark areas on dorsum in front of a line connecting the bases of cornicles; and small groups of dark glandular areas arranged in two indefinite rows on dorsum and distinctly visible in cleared specimens. The wing veins are also faintly dusky-bordered. The apteræ are wholly green throughout or with head and appendages faintly dusky.

Winged viviparous female. Length, 2.6 mm.; width, 0.8 mm.; length of antennæ, 2.6 mm.; length of fore wing, 3 mm. Setæ on head and antennæ very short, somewhat thickened apically, and few in number; hairs thin and sparsely arranged on dorsum and tibial spines are short and stiff. A small prothoracic tubercle and a single small tubercle in each marginal dusky area. *Antennal segment* III with from seven to twelve circular, large and small secondary sensoria arranged somewhat in a row and confined to the basal one-half or two-thirds. *Rostrum* short, extending to second coxæ. *Cornicles* dark, swollen beyond basal constriction as illustrated; faintly imbricated throughout and with a few concentric lines and without true reticulation at apex; 0.45 mm. long. *Cauda* dusky, blunt, with two or three pairs of hairs; 0.25 mm. long.

Apterous viviparous female. Length, 2.8 mm.; width, 1.2 mm.; length of antennæ, 2.2 mm. Uniformly pale green throughout and pulverulent in life; antennæ, legs, cornicles, and rarely also the cauda may appear faintly dusky in cleared specimens. Frontal tubercles well developed and antennal segment I gibbose and roughened on inner surface. Setæ clavate or pointed, very short

and inconspicuous. *Antennal segment* III usually with either one or two small or large circular sensoria near the base. *Rostrum* extends to the second coxæ. *Cornicles* as illustrated; 0.55 mm. long. *Cauda* similar to that of alate; 0.30 mm. long.

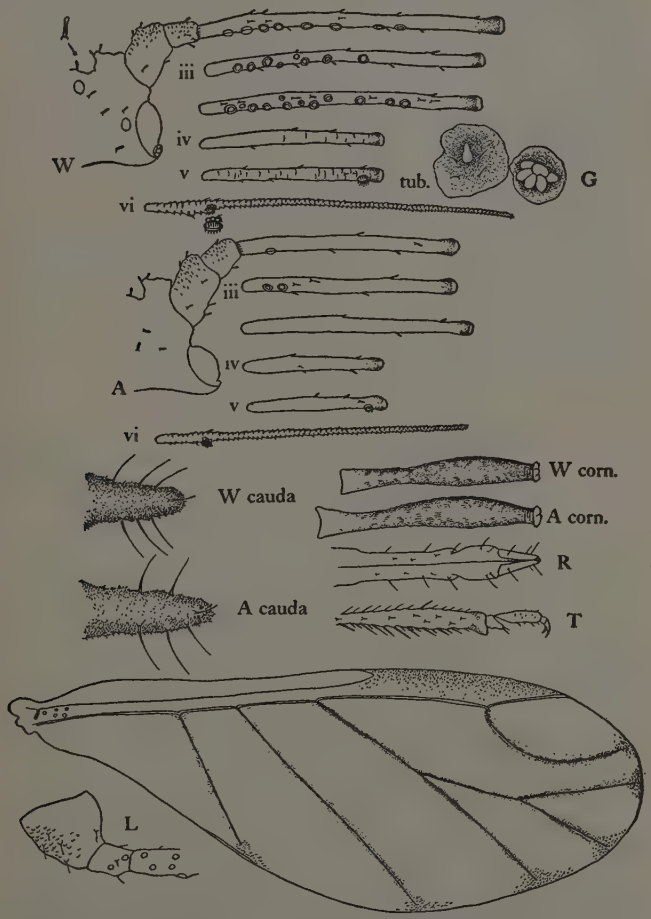

Fig. 1. *Myzus humboldti* Essig, n. sp. W, winged and A, apterous females; G, glandular area from dorsum; L, base of hind leg showing sensoria; R, rostrum; T, distal portion of hind leg; tub, marginal dusky area and tubercle.

This species is likely to be confused with *Myzus lilii* Mason* from which it may be distinguished by the green color, fewer sensoria on segment III of the alates, presence of sensoria on III of the apteræ, the swollen cornicles, and the absence of apical reticulations on the cornicles.

Myzus lilii Mason appears to be very close to if not synonymous with *Macrosiphum scoliopi* Essig which occurs on liliaceous plants in California and which might readily be included in the genus *Myzus*.

These descriptions were made from a series of sixty-three apterous and seven winged viviparous females mounted on twenty slides, two of which are in Belese medium. A single winged specimen is designated as the type and all others are indicated as paratypes. Paratypes have been deposited in the collections of the U. S. Bureau of Entomology and Plant Quarantine, Washington, D. C.

* Mason, P. W., 1940. A revision of the North American aphids of the genus Myzus. U. S. Dept. Agr. Miscl. Pub. No. 371:1-30.

NEW CHILOPODS FROM MEXICO

BY RALPH V. CHAMBERLIN

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The six new species herein described are based upon material collected on the "Third Hoogstraal Mexican Biological Expedition" which was carried out during June and July of 1940. The specimens were collected by Harry Hoogstraal, leader of the expedition, and Kenneth Knight. All material is retained at the University of Utah.

SCOLOPENDRIDA

Scolopendra michoacana Chamberlin, new species

A relatively small form which is olive in color throughout, including antennæ and legs.

Head smooth, without sulci, freely overlapping the first dorsal plate. *Antennæ* composed of sixteen articles of which the first five are glabrous or nearly so. *Prosternum* smooth, the dental plates set off by sulci that meet at middle in a very obtuse angle; teeth distinct, 4—4, with the two innermost on each side fused except at distal end; basal process of femuroid of prehensors large, without

teeth. *First dorsal plate* smooth, without transverse sulcus or paired longitudinal sulci. Paired sulci rather indistinct on second dorsal plate, distinct on third and following plates. Lateral margination weak on eighteenth plate, distinct on nineteenth, twentieth, and twenty-first. Last dorsal plate without trace of median sulcus. *Last ventral plate* narrowed caudad, the caudal corners rounded, the caudal margin straight; without sulci. *Caudal process* of coxopleuræ of anal legs moderately short, bearing four spines distally; a spine on caudal margin of coxopleura; pores very fine and numerous. First to nineteenth *legs* with a single, ventral tarsal spine, twentieth and twenty-first without tarsal spines. Third joint of nineteenth and twentieth legs unarmed ventrally or dorsally. *Anal legs* with fourth joint strongly flattened dorsoventrally; the fifth joint flattened proximally but becoming cylindrical at distal end; the third joint flattened above and over distal portion beneath. Third joint of anal legs at distal end above with a conspicuous process bearing two distal spines; with five spines on mesal surface arranged 1–2–1; three ventral spines in line at mesal edge and seven toward outer side arranged approximately 1–1–2–1–2–1. Other joints unspined. Claw with two spines at base. Length, about 64 mm.

Locality. Michoacan: Tancitaro. Two specimens taken by Hoogstraal, July 20, 1940, at an elevation of 6500 feet under rock in moist woods.

Of specimens known from Mexico, apparently nearest to *S. morsitans,* but readily distinguished from that species in lacking a median sulcus on the last dorsal plate, smaller number of antennal articles, characteristic color, etc.

GEOPHILIDA

Genus Nuevona Chamberlin, new genus

A sogonid genus in which the first maxillæ have pale, slender, membranous lappets. Prosternum with chitinous lines fine or obscure, unarmed; prehensors unarmed. Last sternite broad; coxopleural pores small, typically four or five on each side, these covered by border of the sternite. Anal legs ending in a claw.

Genotype: *Nuevona leonensis* Chamberlin, new species.

Distinguished from all other genera referred to in the *Sogonidæ* except *Garrina,* another Mexican genus, in having the anal legs armed with claws. From *Garrina* it is readily distinguished in having several independently opening coxopleural pores on each side instead of two large pits.

Nuevona leonensis Chamberlin, new species

Head small, longer than wide; widest at about beginning of posterior third and then narrowing caudad and more conspicuously forward. Head overlapping basal plate. Prehensors covered by head; joints all unarmed. *Prosternum* unarmed; chitinous lines weak. *Ventral pores* in a conspicuous band across caudal border, this band widest at middle and angularly extended forward at this point. *Last ventral plate* wider than penult, sides and posterior margin together forming a semi-circle with posterior portion somewhat flattened. Pores four or five in number, covered, or mostly so, by the border of the ventral plate. *Anal legs* with proximal joints moderately thickened in the male; claw well developed. Pairs of legs, sixty-one. Length, 21 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa). One male taken by Hoogstraal and Knight in decaying wood, June 16, 1940, at an elevation of 1500 feet.

Polycricus nuevus Chamberlin, new species

Pale yellow. *Antennæ* of medium length; proximally filiform, distally slightly attenuated; ultimate article nearly as long as the two preceding together. *Head* with cephalic plate longer than broad, widest toward anterior end; anterior corners rounded, the posterior oblique; the sides between corners nearly straight, slightly conveging caudad. No frontal suture evident. Two well defined, pale, clypeal areas. Second maxillæ with coxal plates rather broadly joined, the median area less sclerotized; pores large, open on inner side, the mesal border being membranous or less sclerotized; no chitinous lines. *Spiracles* circular, the first decidedly largest, the second intermediate. *Ventral plates* without apparent pores. Last ventral plate narrow, the sides strongly converging caudad; coxopleural pores over entire surface, fine and very numerous. *Anal legs* without claw, the last joint long and slender, the penult joint of intermediate thickness, the more proximal joints thickest. Pairs of legs, 61. Length, about 30 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). One specimen taken in decaying stump by Hoogstraal and Knight, June 16, 1940, at an elevation of 1500 feet.

This specimen is assumed to be congeneric with *P. toltecus* (Humbert and Saussure), the holotype of which was originally described from the "Eastern Cordillera and Chizoba." Thus *Polycricus* would seem to be very close to *Pachymerium*. The present species seems to differ from *toltecus* in lacking a frontal suture on the head, and in the more strongly narrowed last ventral plate.

LITHOBIIDA

Labrobius major Chamberlin, new species

General color brown. *Head* with marginal lateral breaks slight. *Antennæ* of moderate length, composed of about forty-nine articles. Eyes small, composed of about fourteen ocelli arranged thus: 1, 1, 3, 3, 3; the single ocellus and that at top of patch large, those of bottom row much smallest. Prosternal teeth 2—2 as usual. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates produced, the produced angles broad across base with mesal side long, oblique and convex. *Ventral spines* of first legs 0, 0, 1, 1(2), 1; of the second, 0, 0, 1, 2, 1; of the third, 0, 0, 2, 2, 1. Dorsal spines of first legs 0, 0, 1, 1, 1; of the second, 0, 0, 2, 2, 1; of the third, 0, 0, 2, 2, 2. Posterior legs lost from types; no spines present on their coxæ. *Coxal pores* large and circular; 5, 4, 4, 4. Length, 24 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). Two males taken June 16, 1940, by Hoogstraal and Knight in decaying wood in the "Mesic temperate forest" at an elevation of 1500 feet.

Agreeing with *L. minor*, the genotype, in processes of seventh, ninth, eleventh and 13th dorsal plates, but readily distinguished by its much larger size—24 mm. as against 13 mm., difference in spining of anterior legs, and smaller eyes.

Mexicobius vistanus Chamberlin, new species

Light brownish yellow, with head and posterior end of somewhat orange tinge. Legs yellow. *Antennæ* short, composed in types of twenty-five to twenty-seven short articles. Ocelli 1, 1, 3, 2, those of bottom series much reduced, all pale. *Prosternal teeth* small and widely spaced, 2—2, the median sinus shallow and semicircular; lines of bases of teeth meeting at an obtuse reentrant angle. *Coxal pores* small, round, 3, 3, 4, 3. *Ventral spines* of first legs, 0, 0, 0, 0, 1. *Ventral spines* of penult legs, 0, 0, 1, 3, 3, 2; dorsal, 0, 0, 3, 2, 1; the claw double. Ventral spines of anal legs, 0, 1, 3, 2, 1; dorsal, 0(1), 0, 3, 1, 0; the claw double. Posterior coxæ unarmed. *Anal legs* of male long and slender. *Length* of male holotype about 11 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). Male holotype and a younger male taken June 16, 1940, by Hoogstraal and Knight in the "Mesic temperate forest" at an elevation of 1500 feet.

Readily distinguished from *M. hidalgoensis*, the genotype, in having the posterior coxæ unarmed, in the spining of the legs, and in the much fewer ocelli.

Genus Nuevobius Chamberlin, new genus

Head with distinct lateral marginal interruptions. *Antennæ* very long and composed of numerous articles. Eye-patch composed of numerous seriate ocelli. Prosternal teeth typically 6—6, the special marginal seta ectad of the series on each side. Posterior corners of eleventh and thirteenth dorsal plates well produced, those of the ninth plate scarcely produced. Coxal pits strongly transverse. In the male the anal legs slender throughout, no joint specially thickened but the fourth longitudinally sulcate above.

Genotype. *Nuevobius cavicolens* Chamberlin, new species.

It is with some hesitation that this form is separated generically from *Sozibius*, a genus known from three species occurring in the mountains of Tennessee, North Carolina, and Virginia. It differs, however, in having the posterior angles of the eleventh and thirteenth dorsal plates definitely produced, in the very long antennæ, and the relatively longer legs of which the last pair is especially long and slender. In the latter, the fourth joint in the male is not thickened as in the species of *Sozibius*, but is long and slender. The strongly transverse pores are also characteristic in comparison with the species of *Sozibius*.

Nuevobius cavicolens Chamberlin, new species

Color amber yellow, the legs somewhat lighter than the body. *Antennæ* very long, reaching beyond middle of body, composed of forty-six articles. *Ocelli* numerous; in an elliptic patch in six longitudinal series; single ocellus much largest, contiguous. *Head* with marginal interruptions. Prosternal teeth 6—6; the special seta ectad of series on each side. Posterior angles of nineteenth and thirteenth dorsal plates distinctly produced, those of eleventh slightly produced. *Coxal pores* transversely elongate, pits, some of which seem to have smaller pores, opening into them; 6, 6, 7, 5 arrangement. *Ventral spines* of last legs 0, 1, 3, 3, 2; dorsal, 1, 0, 3, 1, 0; claw unarmed. Ventral spines of penult legs, 0, 1, 3, 3, 2; of dorsal, 1, 0, 3, 1, 1; claw unarmed. Ventral spines of first legs 0, 0, 2, 2, 1. Last four pairs of coxæ dorsally armed, last three pairs also laterally. *Anal legs* of male very long, all joints slender, the fourth widely longitudinally furrowed above. Length, about 15 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). One male taken June 16, 1940, by Hoogstraal "in dung of bat cave, one-quarter mile from entrance." "Mesic temperate forest," elevation 1500 feet.

A NEW SPECIES OF BRUCHUS WITH NOTES ON BRUCHUS MAJOR FALL AND JULIANUS HORN
(Coleoptera, Bruchidæ)

BY BURDETTE E. WHITE
Merced, California

On checking over the J. N. Knull collection of Bruchidæ recently, the writer had the pleasure of observing numerous specimens of *Bruchus julianus* Horn (=*ochreolineatus* Fall). The late Dr. H. C. Fall, in his brief description of *B. major,* in which he compares *julianus* with *major,* overlooked the most important diagnostic character separating the two species. This is the dentiform elevations of the basal margins of the elytra. It is best seen from a posterior view over the top of the elytra and shows as two small, approximate humps on each side of the scutellum midway between the humeri and the scutellum. In *julianus* the elevations are located between the second and fourth elytral striæ and are very approximate. In *major* these structures are more acute, more widely separated, and most important—are located between the fourth and fifth striæ. This character appears constant for some seventy-five specimens of *julianus* observed from various localities in Texas, Arizona, and Lower California, and for numerous examples of *major* from Brownsville, Texas.

Dr. Fall apparently had large, well characterized specimens of *major* in hand when he described the species. The material in the collections of Dr. Knull and the writer shows *major* to vary considerably in size and markings. In fact, the above described character was the only means for determining one badly rubbed specimen of *major.* In an earlier synopsis of the species of *Bruchus* (1910), Dr. Fall implied that this character is too variable to be important.

A specimen of the *julianus* complex from the Huachuca Mountains, Arizona, possesses such differences in character as to seem worthy of consideration. Later collections from this area may prove it to be a subspecies of *julianus;* but until further material manifests this possibility, the present specimen is described as a distinct species.

Bruchus knulli White, new species

Size and shape of *julianus* Horn but lacking the ochreous lines of pubescence on the elytra, with the antennæ entirely pale, and with the pygidium finely punctate whereas *julianus* has coarse

punctures. The shape of the body differs noticeably; *julianus* is parallel sided whereas *knulli* is gradually narrowed from middle to base of elytra. The punctures of the elytral striæ are coarse and strongly impressed in the former while they are fine and feebly impressed in the latter. Ferrugineous pubescence evenly clothes the surface of the elytral disk and pronotum of *knulli*. The basal elytral denticles are similar in both forms. Specimens of *julianus* are frequently rubbed, obscuring the ochreous lines of pubescence on the elytra, but this specimen of *knulli* has not been rubbed. Length, 4.5 mm.; width, 2.6 mm.

Holotype, female, collected by J. N. Knull in the Huachuca Mountains, Arizona, July 20, 1936, in the Knull collection at Ohio State University. The species is gratefully named in honor of its collector.

The usual technical description has been omitted because of the similarity to a description of *julianus*. The position of *knulli* in our list should be between *julianus* and *quadridentatus* Schffr.

GEOMETRID NOTES AND NEW SPECIES
(Lepidoptera)

BY EDWARD GUEDET
Napa, California

Nemoria mentastii Guedet, new species

Palpi pale ochreous tinged with reddish. *Front* tinged with reddish. *Collar* and thorax green. *Abdomen* with three white dorsal spots narrowly circled with reddish. *Primaries* light green; costa narrowly edged with pale ochreous; ante-median line white, starting about one-third out from base, perpendicular to costa and running with a slight outcurve to inner margin about three-fifths out from base where it rounds out meeting the post-median line; without discal dot; post-median line straight, parallel with outer margin, forming a V with the ante-median line; fringe ochreous with a very slight tinge of reddish at apex. *Secondaries* pale green, concolorous with primaries; ante-median line boldly and evenly outcurved; without discal dot; post-median line with a slight angle on the median vein; fringe as on primaries. *Beneath* paler green; without discal dot; lines above faintly showing through. *Expands* 27 mm.

Holotype, female, No. 5185, Calif. Acad. Sci., Ent., Glen Ellen, Sonoma County, California, May 12, 1940.

The distinctive feature of this species is the V-shaped lines of the primaries. The species is named after the Rev. R. Mentasti, of Sonoma, California, through whose kindness I received the unique type.

Hydriomena albifasciata, form beldenæ Guedet, new form

Barnes and McDunnough (Cont. Lep. N. A., iv. 10, 1917) described the form *punctocaudata* from Sonoma and Alameda Counties, California, featuring the dull olive-green color with smoky suffusion obscuring the maculation, and the distinct white subterminal spot with a tail. A series of specimens from Glen Ellen, Sonoma County, California, has the distinct white subterminal spot in a prominent very irregular zigzag subterminal white line running from the costa almost to the inner margin. The primaries are suffused with ruddy, much as in the form *resecta* Swett, but the black bands of the typical form are quite plain.

Holotype, male, No. 5186, Calif. Acad. Sci., Ent., Glen Ellen, Sonoma County, California, February 8, 1941. Allotype, female, and three male paratypes, same data, in my collection.

For this form I propose the name *beldenæ* in honor of the collector, Miss Rita Belden of Sonoma County.

Mesoleuca gratulata, form bakeri Guedet, new form

The median white band of the typical *gratulata* is strongly constricted below the cell, due to the outward bulge of the dark basal area and an inward bend of the outer dark area. Barnes and McDunnough (Cont. Lep. N. A., iii, 232, 1917) described a new variety *latialbata* in which the median white band is of much more even width throughout, the basal area being only slightly projected below the cell, and the outer line bent far less than in the typical form. In four male specimens from Oregon we find the opposite extreme, the dark basal area meets the dark outer area below vein four, reducing the median area to two white patches, one surrounding the discal spot and the other below, resting on the inner margin.

Holotype, male, No. 5187, Calif. Acad. Sci., Ent., Alsea, Oregon, April 12, 1930. Three paratypes, males, Corvallis, Oregon, May 14 and May 29, 1930, in my collection.

Named in honor of Mr. James Baker, of Baker City, Oregon, whose correspondence on entomological matters is greatly appreciated.

Amphidasis multidentata Guedet, new species

Palpi short. *Thorax* and *abdomen* stout, hairy. *Primaries* with black spot at extreme base; ante-median area white, irrorate with black; ante-median line black, generally outwardly oblique, with three large rounded outward curves; median area more irrorate with black, giving a darker appearance; discal dash large, black, almost vertical; post-median line black, composed of nine very irregular teeth pointed inwardly, coming close to the ante-median

line on the inner margin; post-median area about the shade of the basal area; vein ends marked with black lunules with white centers, the black extending in blotches into the wing. *Secondaries* smoky; discal spot large, smoky; post-median line diffuse, irregular; marginal line of lunules as on primaries, but broken; fringe checkered. *Beneath* much as above, maculation reflected. *Expands* 35 mm.

Holotype, female, No. 5206, Calif. Acad. Sci., Ent., Fly Peak, Chiricahua Mountains, Cochise County, Arizona, 9000-9300 feet, July 30, 1927. Two female paratypes, same locality, July 28, 1927, all collected by Mr. J. A. Kusche, and all in the collection of the California Academy of Sciences.

Lygris pulcherrima Guedet, new species

Palpi long. *Antennæ* of male bipectinate. *Hind* tibiæ with all spurs. *Thorax* with dorsal tuft posteriorly. *Abdomen* smooth. *Primaries* with basal area chocolate-brown, irrorate with lavender; ante-median line faint, lavender, bent out below costa, then slightly outwardly oblique, broken, with sharp outward tooth just before inner margin; median area darker brown, well defined; discal spot plain, lavender; post-median line white, with three large irregular teeth projecting outwardly; the first very sharp, the second angular with rounded point, the third well rounded, the general direction slightly outwardly oblique; beyond the first tooth with a small brown cloud, and beyond the second tooth with a larger brown cloud, both limited by a crenulate, irregular, subterminal white line; outer area whitish lavender, sprinkled with brownish blotches; fringes checkered with brown at vein ends. *Secondaries* orange in color on upper two-thirds; costa faintly marked with whitish; lower one-third whitish-lavender, sprinkled with brownish specks and dashes; without ante-median line; discal spot faint; post-median line faint, crenulate, irregular, narrowly shaded outwardly with lavender near anal angle; outer margin slightly crenulate; fringe whitish. *Beneath* primaries yellowish-white, veins marked with yellowish; without ante-median line; discal spot faint, blackish; post-median line well-marked, blackish, irregular; outer area lighter with large subapical blotch cut by veins; fringe checkered. *Secondaries* brownish-yellow on upper two-thirds; discal spot black; post-median line black, broad, prominent, disappearing before reaching inner margin, followed by a light shade; outer area soft chocolate-brown. *Expands* 31 mm.

Holotype, male, No. 5205, Calif. Acad. Sci., Ent., Cave Creek, Chiricahua Mountains, Arizona, July 4, 1930, J. O. Martin collector.

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